

***Trichoglossum tetrasporum*, newly recorded from India**

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ABSTRACT—The uncommon earth tongue, *Trichoglossum tetrasporum*, is recorded for the first time from India. Macroscopic and microscopic characters of the species are described and illustrated along with its world distribution.

KEY WORDS—apothecia, *Geoglossaceae*, *Geoglossales*, paraphyses, setae

Introduction

Earth tongues (*Geoglossomycetes*; Schoch & al. 2009) are a widely distributed group of fungi that have been under intense investigation since the descriptions of *Geoglossum* Pers. in the late 18th century and *Trichoglossum* Boud. in the late 19th century. The widely distributed group includes such genera as *Geoglossum*, *Nothomitra* Maas Geest., *Sarcoleotia* S. Ito & S. Imai, and *Trichoglossum* (Schoch & al. 2009, Hustad & al. 2011).

Trichoglossum is separated from *Geoglossum* based on the production of abundant dark setae (hairs) in the hymenium and on the stipe (Mains 1954, Sinden & Fitzpatrick 1930). About 19 *Trichoglossum* species are currently recognized (Kirk & al. 2008, Hustad & al. 2013), although Index Fungorum (2018) lists 23 species and 48 varieties, which include a number of synonyms and dubious taxa (Hustad & al. 2013).

Sinden & Fitzpatrick (1930) described *Trichoglossum tetrasporum* from New York State, USA. It has since been reported from China (Tai 1944, Mains 1954), Great Britain (Nannfeldt 1942), Netherlands (Maas Geesteranus 1964), Denmark (Benkert 1976), Spain (Gálan & Rubio 1998), and Italy (Lantieri 2011). Here we extend its distribution range to India. The macro- and micro-morphological features of the Indian collection are described and illustrated below.

Materials & methods

Collection area

The samples were collected from Suryamaninagar (23°45.70'N 91°15.79'E; 80 m asl), West Tripura, Northeast Region, India. Tripura, one of seven states in north-eastern India, occupies a geographical area of 10,491 km², of which 6292 km² (c. 60%) is covered with forest. The state is located at 22°57'–24°33'N 91°10'–92°20'E. Its climate averages are: temperature 10°C–35°C, relative humidity 50–80%, and annual rainfall 2100 mm.

Specimen collection and identification

The specimens were collected from natural habitats using forceps and photographed. The apothecia and ascogenous portions were measured just after collection from field. Samples were dried for 24 hours at 45–55°C in a ROV/DG hot-air oven. After drying, samples were preserved for further analysis in a polyethylene bag also containing 1,4-dichlorobenzene (Debnath & al. 2017). The dried material was preserved in the Mycology and Plant Pathology laboratory, Department of Botany, Tripura University, bearing the collection tag MCCT (Mushroom Culture Collection Tube)-380. A small portion of a hand-sectioned specimen was squash-mounted in 5% potassium hydroxide (KOH) solution. Slides were also mounted in Melzer's reagent, Lugol's solution, and lactoglycerol and Congo Red solution for observation of anatomical characters under an Olympus CX21i bright field microscope equipped with a SLI500 camera. Diagnostic features including the asci, ascospores, paraphyses and setae were studied and compared with different descriptions for identification (Sinden & Fitzpatrick 1930, Mains 1954, Maas Geesteranus 1965). The collection was deposited in Central National Herbarium, Botanical Survey of India, Howrah, West Bengal, India (CAL).

Taxonomy

Trichoglossum tetrasporum Sinden & Fitzp., Mycologia 22: 60 (1930) Figs 1, 2

APOTHECIA scattered to gregarious, black or brownish black, clavate to capitate, 10–90 mm long; head compressed, 20–40 × 20–30 mm diam., hirsute from setae; odourless. STERILE PORTION OR STIPE cylindrical, slender, 2–3 mm thick, hirsute from setae. ASCI clavate, 4-spored, 170–195 × 16–20 µm, rounded

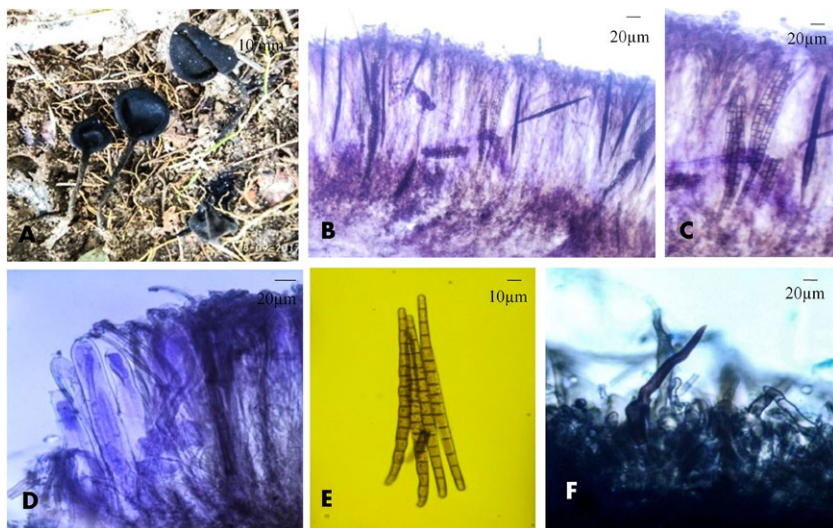


FIG. 1. *Trichoglossum tetrasporum* (CAL 1687): A. Mature fruit body in natural habitat; B. Cross section of head showing mature asci, setae, and paraphyses; C. 4-spored asci, dark brown setae, and bulbous paraphyses with curved capitate tips; D. Immature stage of asci with paraphyses; E. Slightly curved ascospores with 15 transverse septa; F. Irregularly flexuous setae of stipe. Scale bars: A = 10 mm; B–D, F = 20 µm; E = 10 µm.

at apex, short-pedicellate. ASCOSPORES parallelly arranged in the upper part of the ascus; fusoid to subcylindrical, smooth, $130\text{--}145 \times 5\text{--}7$ µm, with 10–15 transverse septa when mature (fewer when immature), slightly curved, dark brown when mature; apical ends narrowed and rounded; individual cells often uniguttulate. HYMENIAL SETAE $180\text{--}220 \times 5\text{--}13$ µm, smooth, straight to flexuous. PARAPHYSES 2–4 µm wide, sub-cylindrical toward the bottom but often with some swollen, filamentous, septate, and curved at tips. STIPE SETAE irregularly waved outline, dark brown, measuring $170\text{--}200 \times 4\text{--}12$ µm.

SPECIMEN EXAMINED: INDIA, NORTHEAST REGION, West Tripura, Suryamaninagar, $23^{\circ}45.70$ N $91^{\circ}15.79$ E, 80 m asl, saprobic on soil with decomposed plants, 18 September 2017, Debnath & Saha (CAL 1687).

DISTRIBUTION: *Trichoglossum tetrasporum* has been reported from USA, Great Britain, Netherlands, Denmark, Spain, Italy, China, and India.

Discussion

Trichoglossum tetrasporum is characterized by a hymenium with numerous acuminate brown setae, 4-spored asci, and 10–15-septate ascospores. It is

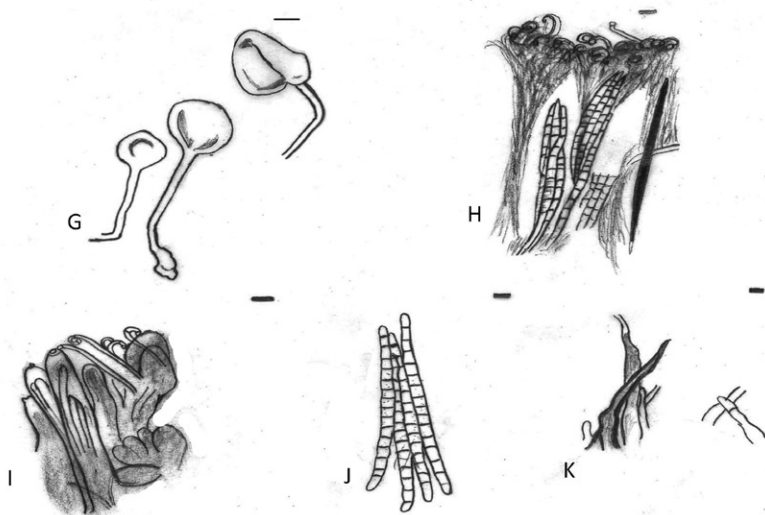


FIG. 2. *Trichoglossum tetrasporum* (CAL 1687): G. Mature fruit body; H. 4-spored asci, setae, and bulbous paraphyses with curved capitate tips; I. Immature stage of asci with paraphyses; J. Slightly curved ascospores with 15 transverse septa; K. Irregularly flexuous setae of stipe. Scale bars: G = 10 mm; H, I, K = 20 µm; J = 10 µm.

morphologically quite close to *T. hirsutum* (Pers.) Boud. and *T. velutipes* (Peck) E.J. Durand but is distinguished by the size of asci and ascospores and number of ascospore septa. Most authors report 15 septa for *T. tetrasporum* ascospores (Sinden & Fitzpatrick 1930, Seaver 1951, Ellis & Ellis 1988, Gálan & Rubio 1998), which mostly corresponds with our findings. Mains (1954), however, reported a much more variable number of septa (0–17) for the species.

Tai (1944) described *Trichoglossum tetrasporum* var. *brevisporum* F.L. Tai and *T. yunnanense* F.L. Tai from Yunnan, China. His description of *T. tetrasporum* var. *brevisporum* showed similarities with our specimen but differed by its smaller ascospores ($117\text{--}137 \times 6\text{--}7$ µm); and his description of *T. yunnanense* differed from *T. tetrasporum* by its longer and narrower asci ($237\text{--}294 \times 19\text{--}22$ µm) and its longer ($143\text{--}187 \times 6\text{--}7$ µm) and differently shaped (cylindrical clavate) ascospores. However, Mains (1954) considered *T. yunnanense* to represent “a longer, more variable, septate-spored variant of *T. tetrasporum*,” and recombined it as *T. tetrasporum* var. *yunnanense* (F.L. Tai) Mains. Species Fungorum (2018) accepts both names as varieties of *T. tetrasporum*.

A literature survey found no report of *T. tetrasporum* from Asia other than Tai (1944); our record from India therefore represents only the second Asian report in 74 years.

Prabhugaonkar & Pratibha (2017) documented a new record of *T. rasum* Pat. from Asia, also providing a preliminary phylogeny of *Trichoglossum* showing *T. hirsutum* as polyphyletic, in concordance with previous findings by Hustad & al. (2013). Phylogenetic investigations of *T. tetrasporum* from different continents may clarify whether the differences in spore size and septation reported by different authors represent one highly variable species with a wide distribution or include one or more cryptic species.

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